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55) Laundry ironing or pressing apparatus.

57) A combined heated ironing board or table, which can be converted for use as a trouser press or as a food warming tray or support is disclosed. The heated ironing board (11) of the invention includes one or a plurality of heater elements, a platform (18; 86; 87) and a control panel (78) housing a control circuit (31; 60-75) by means of which the temperature at the surface of the platform (12; 76, 77) may be regulated. A cooperating pressure plate (44; 83) adapted to be fitted to the heated ironing board platform (12; 76, 77) is provided for performing tasks such as pressing trousers or other garments.

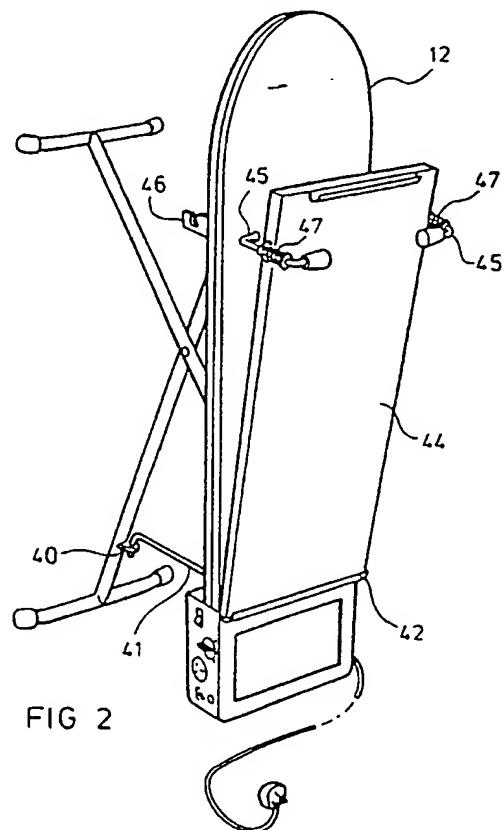


FIG. 2

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Domestic Laundry Equipment

The present invention relates to domestic equipment primarily for use in performing laundry tasks such as pressing and ironing clothing, but which is also adaptable for other uses. Although it has long been recognised in commercial laundries that pressing of clothes can most effectively and quickly be performed by means of apparatus which applies heat to both sides of the fabric, this fact has not in the main been taken into account in the domestic laundry. Pressing or ironing tasks are almost always performed in a domestic situation by applying a heated flat iron to the upper surface of garments supported on an unheated platform in the form of an ironing board or table.

Although previous attempts have been made to produce a heated ironing board or table these have not been technically entirely satisfactory and for this reason have not met with significant commercial success. For example, the prior art heated ironing boards have either been unable to provide a sufficiently high temperature to obtain a significant effect or, if the temperature was sufficiently high, there were inadequate safeguards to prevent the user from becoming burned or at least made severely uncomfortable by the heat given off by the board. Thus, although domestic ironing is considered by many as a tedious and time consuming chore, and although various attempts have been made to automate the processes concerned in order to reduce the time involved, the majority of people still iron clothes using only a flat iron and an unheated ironing board or table. Apparatus previously tried in an attempt to speed up the process includes heated rollers between which the domestic items are intended to be passed in order to effect pressing thereof. Such equipment has failed to gain general acceptability however because the rather complex shapes of garments of wearing apparel cannot satisfactorily be accommodated by such a roller arrangement.

By way of example of another prior proposal, FR-A 2128966 describes a sleeve-board with a heatable surface having a series of holes or ducts for the passage of steam, and an articulated pressure plate attached thereto at one end of the said heatable surface.

The present invention seeks, therefore, to provide an improved apparatus capable of enabling domestic ironing or pressing operations to be performed more quickly and easily than has hitherto been possible, whilst at the same time providing comfort and security for the user.

According to one aspect of the present invention, there is provided domestic laundry equipment comprising a heatable ironing board having a sub-

stantially flat working platform, platform support means for supporting the working platform spaced from the ground, a heater for raising the temperature of the platform surface, and a pressure plate for cooperation with the heatable platform to form a static press assembly for pressing garments such as trousers, characterised in that means are provided for detachably connecting the pressure plate to the heatable platform.

10 The present invention preferably includes a working platform in the form of an ironing board or table having an electrical resistance element associated therewith for generating heat to raise the temperature of the surface of the platform of table to a value in the region of 90°C to 120°C. The electrical resistance element may be provided in one of a number of different ways. For example, the electrical resistance element may be embedded in the material of the platform, which for this purpose may be a suitable ceramic or plastics insulating material, or may be of metal with suitable ceramic or plastics insulators, or insulators of other suitable material between the metal and the electrical resistance elements, or may be aluminium or other material having high thermal conductivity.

15 Alternatively the electrical resistance element may be carried by a cover which overlies the surface of the platform. Such a cover may be formed as a separate laminar sheet or as a sleeve which can be held in position on the platform by suitable means such as tie straps or press studs, or by bolt ropes engaged in cooperation grooves in the board or table. It is preferred that there are provided means for connecting the said electrical control circuit to the platform electrical heater whereby the said electrical control circuit exercises simultaneous independent temperature control of said flat iron and the said heatable platform by regulating the electrical supply thereto.

20 In a preferred embodiment the electrical control circuit means comprises an energy regulator, means for connecting the said energy regulator to a source of electrical supply and means for connecting said energy regulator to the said electrical resistance heater of the said platform.

25 Means may be provided to detect the temperature of the surface of the working platform. Such means may comprise one or more sensors, and this temperature detection can be used to control the energy supplied to the resistance element. The temperature sensors may be of a conventional bimetal strip type or may be thermocouples.

30 The present invention therefore provides apparatus by means of which a domestic ironing board may be used as a trouser press by coop-

eratively adapting it with a pressure plate and means for heating the trousers or other garment pressed between the board and the plate. The ironing board is heated but optionally the pressure plate may additionally be provided with heater means, in which case both the pressure plate and the ironing board platform have heaters, whereby garments are pressed by heat applied to both sides simultaneously.

In another aspect the present invention provides a heated ironing board having end portions which fold under the platform to reduce the length of the ironing board and allow it to be used as a food warming hot plate.

The control circuit on the board may include a timer which automatically switches off the resistance heating element of the platform after a pre-determined period of time. This allows the user to set up the static press assembly comprising the board and the pressure plate, and leave the equipment in operation to attend to other matters. Means are provided for resiliently urging the pressure plate firmly into contact with the platform. For convenience the support frame or legs of the ironing board may be adapted with a spacer stay so as to hold the platform in a generally upright orientation with one end in contact with the ground where in normal operation the support frame holds the platform generally horizontally.

According to further optional features of the invention, the said electrical platform heater comprises two separate heater elements extending over different areas of said platform, the said platform being formed in two parts substantially co-extensive with said two heater elements respectively, one said platform part being foldable with respect to the other said platform part between a first position where it lies substantially coplanar with said other platform part and a second position where it is folded to a position out of the plane of said second platform part. Coupling means may be provided on the said plate for mounting the latter to the said platform of the ironing board, the said coupling means including resilient biasing means for urging the said plate into contact with the said platform under pressure when said plate means is mounted thereon, and heater means on the said pressure-applying plate.

A resilient foam cover means may be provided for said working platform to cover the hard upper surface thereof and provide a resilient flexible surface suitable for pressing or ironing garments by means of the flat iron, and quick release attachment means for securing said resilient foam cover means in position over the said working platform whilst allowing ready removal thereof to expose the said hard upper surface for use as a food-warming platform or other heating uses.

Various embodiments of the present invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:-

5 Figure 1 is a perspective view of a first embodiment of the invention shown in its normal operating position;

10 Figure 2 is a perspective view of the embodiment of Figure 1 adapted for use as a trouser press;

15 Figure 3 is a schematic circuit diagram of the electrical circuit for controlling the energy supplied to the resistance heater element of the embodiment illustrated in Figures 1 and 2;

20 Figure 4 is a circuit diagram of a control circuit suitable for use in an embodiment of the present invention;

25 Figure 5 is a perspective view of a second embodiment of the invention, illustrated in its fully erected position;

30 Figure 6 is a perspective view of the embodiment of Figure 5, shown in a partly collapsed position;

35 Figure 7 is a perspective view of the embodiment of Figure 5 in a fully collapsed position and with a cooperating pressure plate fitted thereto;

40 Figure 8 is an exploded view of some of the components of the embodiment of Figure 5; and

45 Figure 9 is a cross-sectional view taken on the line IX-IX of Figure 7.

Referring now to the drawings, the embodiment shown in Figure 1 is externally very similarly formed to a conventional ironing board and is generally indicated with the reference number 11. The ironing board 11 comprises a generally planar, approximately rectangular platform 12, tapered at one end, and carried by an underlying support frame generally indicated 13 and comprising two legs 14, 15 pivotally connected at a point intermediate therein by a pivot 16, and each having a transverse foot 17 for engaging the ground when the board 11 is erected for use. Suitable means for inter-engaging the support frame legs 14, 15 with the underside of the platform 12 to effect variation in the height of the platform above the ground are provided, but such may be conventional and are not described in further detail herein.

50 A platform 12 is provided with a resistance heater element 18, made from an insulated electrical element embedded in the material of the platform 12 and connected to a power supply panel generally indicated 19 carried at one end of the platform 12. The power supply 19 has an electrical lead 20 terminating in a conventional plug 21 for connection to a mains wall socket of normal type. The platform 12 may be constituted by one or a plurality of elements or units of a ceramic or glass

material with heating elements embedded in them, or alternatively may be any other suitable, perfectly electrical insulating material having a high thermal conductivity capable of withstanding continuous use of the high temperatures involved in operation. Such temperatures may be, for example, in the region of 90°C to 120°C and may reach even higher values locally, for example in the immediate vicinity of the heater elements. A cover element of material having thermal insulating properties to meet the criteria discussed below in relation to the embodiments of Figures 5 to 9 is also employed but is not illustrated in Figure 1.

On one side of the power supply panel 19, namely the side facing the observer in Figure 1, there is provided a socket 23 for receiving a cooperating plug of an electrical lead of a pressing iron to be described in more detail below. A changeover switch 22 and an isolating switch 24 are also provided for purposes which will be described in more detail below, and an indicating lamp 25 is provided, which lamp illuminates when the apparatus is plugged in.

As can be seen from Figure 3 the electrical lead 20 is applied via a fuse 26 to a circuit junction 27 in a lead 29 with the lamp 25 being connected directly across between the positive and neutral terminals of the lead 20 to provide an indication at all times that the apparatus is plugged in. A timer 28 is connected between the lead 29 and a lead 30 which is connected to an energy regulator 31 which is connected via a second lead 32 to the neutral wire 33 of the lead 20, and via a lead 34, to the switch 24, which latter is connected in series with the electrical resistance element 18 of the platform 12. A line 38 leads from a junction point 39 in the line 30, between the timer 28 and the energy regulator 31, to a terminal 40 of the switch 22 which also has a contact 42 in the line 34 between the energy regulator 31 and the switch 24 and a contact 43 constituting the movable contact of the changeover switch 22. The movable contact 43 is connected to a line 44 leading to one contact pin of the socket 23 the other contact pin of which is connected to the neutral line 33.

An electrical iron having a resistance heating element but no temperature control mechanism can be provided for use with the ironing board of the present invention. Such an iron is connected to the socket 23 by means of a suitable cooperating plug with which can be provided, and the combined energy consumption of the resistance heating element of the iron, taken via the socket 23, and the electrical resistance element 18 of the ironing board 12 is controlled by the energy regulator 31 which can be suitably set by a control knob 36 on the power supply control panel 19.

By opening the switch 24 the electrical resis-

tance element 18 can be disconnected leaving the power supply extending only through the socket 23 to the iron enabling greater control of the equipment when handling delicate fabrics such as silk.

5 By commuting the changeover switch 22 to the opposite position from that shown in Figure 3 the energy regulator is cut out of the supply to the socket 23. An electric iron having its own thermostat can then be used either alone or in combination with the energy regulated heated platform 12. For use as a trouser press the support frame 13 is provided with a lug 40 and stay 41 so that the platform 12 can be positioned in a generally upright orientation. Between the platform 12 and the power supply control panel 19 is a hook-shape channel 42 which receives one end of a flat pressure plate 44 having a pair of spring loaded connector arms 45 with hooked ends for interconnection with cooperating catches 46 on the platform 12. When suitably positioned on the platform 12 the pressure plate 44 can be used to apply pressure for example to a pair of trousers which can be introduced between the pressure plate 43 and the platform 12, the pressure being maintained by the springs 47 of the connector arms 45. When a pair of trousers has been positioned between the pressure plate 44 and the platform 12 the equipment is switched on and it automatically switches off after a predetermined time set by the timer 28. Although not illustrated, the pressure plate 44 may be provided with its own heater element and a lead which can be plugged into the mains or the socket 23 so that heat can be applied to both sides of a pair of trousers at once. Likewise the trouser press, although shown in operation in a vertical position, may alternatively be used in a horizontal position for such items as pleated skirts, curtains or like such items. The present invention also comprehends trouser pressing apparatus comprising an electrically heated pressure plate adapted to be attached by pressure-applying means to a conventional unheated ironing board and to be plugged directly into the mains supply.

45 In the second embodiment of the invention illustrated in Figures 5 to 9, there are provided resistance heater elements which can be used after removal of a protective cover to provide a firm surface and a higher temperature so that the apparatus can serve double duty as a food hotplate to maintain food at the right temperature after cooking. This can be controlled by means of a suitable rotary switch and indicated by an additional light or lamp. Operation of such a switch would also disconnect the outlet socket 23 for safety reasons.

50 When the apparatus is used as a food hotplate the trouser press plate, with its own fabric cover removed (if it has one), can be used as a cold shelf by fitting it to supports under the platform 12, in a

manner which will be described in more detail with reference to Figures 5 to 7 below.

First, however, the circuit of Figure 4 will be described. This circuit is provided for control of a special flat iron (not shown) and is intended to be mounted on the board of Figures 1 to 3 or on the board of Figures 5 to 9 and to control the specially adapted flat iron connected thereto via a socket such as the socket 23 of Figure 1 but which would be formed as a five pin socket instead of the three pin socket shown in Figure 1. Such a socket is connected to form electrical leads 48, 49, 50, 51 and to a safety earth wire (not shown). The leads 50, 51 are in use connected via this socket to wires leading to a thermistor in the iron and the leads 48, 49 are in use connected via the socket to wires leading to the resistance element of the iron.

In operation the circuit is supplied from a source connected to terminals 58, 59. Across these input terminals are connected the contacts 60 of a relay the coil 61 of which is connected across the terminals 58, 59 with a protection resistor 62 in series therewith and the collector-emitter junction of a transistor 63 controlling the energisation of the relay coil. The transistor 63 forms part of a Darlington pair with a second transistor 64 the base of which is connected between two resistors 65, 66 in a voltage dividing circuit arrangement at the output of an amplifier 67 connected to a differential summing amplifier, the non-inverting input of which receives signals from a bridge circuit comprising the thermistor which is connected across lines 50, 51 and is in series with a resistor 68 between the positive voltage line 69 connected to the input terminal 58 and the negative line 70 connected to the input terminal 59. The other arm of the bridge comprises resistors 71 and 72 connected between the positive line 69 and the negative line 70 and the junction between which is connected via a resistor 73 to the inverting input of the amplifier 67. The resistor 72 is a variable resistor the adjustment of which determines the selected temperature of operation of the system. The circuit also includes a capacitor 75 the function of which will be described below.

The operation of the circuit is as follows. Depending on the selected resistance of the resistor 72 the temperature variation experienced by the thermistor in the flat iron once the heating element in the iron is energised will change the balance conditions of the bridge comprising the thermistor itself, the resistor 71, the resistor 68, and the resistor 72 which are connected, as described above, in pairs across the non-inverting and inverting inputs of the amplifier 67. As the temperature experienced by the thermistor due to the heating effect of the elements 55 and 51 (the iron will of course be applied to the board during use with the

item being ironed being located between the boards and the iron) the resistance of the thermistor falls until the bridge passes a balance point allowing the capacitor 75 to discharge through the thermistor causing a surge in the current which is amplified by the differential amplifier 67 applying a control signal to the base of the transistor 64 causing it, and therefore the transistor 63, to conduct completing the circuit through the coil 61, energising it and thereby opening the normally closed contacts of the relay 60. Power is thus cut off to the heater element connected across lines 50, 51 and this then starts to cool until the resistance of the thermistor has increased to such a value as to cause the bridge to become unbalanced again stopping the amplifier 67 from conducting and thereby switching off the transistors 64, 63 de-energising the coil 61 and allowing the contacts 60 to reclose and allow current to pass again to the heating element which therefore again starts to heat up.

Turning now to the embodiment illustrated in Figures 5 to 9, the ironing board comprises a platform having a main portion 76 and an end portion 77 hingedly connected thereto so as to be turnable between an erected position illustrated in Figure 5 and a folded position illustrated in Figure 6. At the opposite end of the main platform portion 76 is a control panel 78 which is also hingedly mounted to the main portion 76 by means of a piano-type hinge 79 so that it can turn between an erected or extended position as illustrated in Figure 5 and a folded position as illustrated in Figure 6. Suitable spring clips or other retaining means 80 are provided for retaining the control box 78 in its extended position and likewise, suitable retaining means (not illustrated) are provided for holding the end portion 77 of the platform in its extended position so that it remains substantially coplanar with the main portion 76 when pressure is applied from above in use of the ironing board.

The platform comprising the main panel portion 76 and the end portion 77, together with the control box 78 is supported on two pairs of legs identified as a near pair 81 adjacent the control box 78 and a distal pair 82 nearer the far end of the panel 76. The distal legs 82 are spaced closer together than the near legs 81 and all the legs are pivotally mounted to the underside of the panel 76 so that they can be folded to a collapsed position or to a partly collapsed position as illustrated in Figure 7.

The legs 81, 82 are provided with retaining means (not shown) for supporting a subsidiary shelf 83 which, as can be seen in Figure 7, can be fitted to the main panel portion 76 of the platform in a suitable manner to act as a trouser press pressure plate like the pressure plate 44 in the embodiment of Figures 1 to 3.

Referring now to Figure 7 the platform 76 comprises a supporting base 84 to one end of which the control box 78 is hingedly mounted by the piano hinge 79 (Figure 6) whilst at the other end a distal support panel 85 is correspondingly hinged by a suitable piano hinge (not shown). The electrical resistance element is formed in two parts 86, 87 each of which respectively overlies the support platform 84 and distal portion 85 to which they are secured by a heat distribution cover panel, again formed in two parts 88, 89.

The material used for the heat distribution cover panel 88, 89, is preferably a light metal such as aluminium or an aluminium alloy or other material having a high thermal conductivity. The operating surface temperature range envisaged for the surface of the board is between 90°C and 120°C, which gives faster and better ironing results when used with a domestic pressing iron having a temperature lying in the range of 120° to 210°C. It is envisaged that the temperature control of the ironing board surface will be adapted to the temperature control of a domestic pressing iron such that a temperature of 90°C at the board surface will be provided with an iron temperature of 120°C and, at the other end of the range, an ironing board surface temperature of approximately 120°C will be matched by an iron temperature of about 210°C. Corresponding adjustments, which may be incremental or infinitely variable, may be provided by the temperature control mechanism.

The board operating temperatures are achieved by employing electrical resistance elements 86, 87 having the appropriate electrical resistance to give an electrical loading in the region of 0.4 Watts per cm². A typical surface area for a traditional ironing board surface is in the region of 2250 cm² and at 0.4 Watts per cm² the total electrical loading would thus be 900 Watts. The heat-up time of an electrical element having these parameters will match that of a currently available domestic pressing iron so that the heated board will be ready for use at the same time as the pressing iron assuming that both are switched on at the same time.

The 900 Watts electrical load, when considered in combination with the 1100 Watt electrical load of a currently available dry/steam iron gives a total electrical consumption of 2 Kw, but because the ironing time is reduced by at least 33 $\frac{1}{3}$ % the overall electrical energy consumption is in many cases less than that consumed with an unheated board over the longer time period taken to complete the pressing and ironing operations.

The heat distribution elements 88, 89 shown in Figure 8 are aluminium with elongate fixing holes 90 allowing for firm clamping to the platform parts 86, 78 by rivets, screws or the like whilst still

allowing longitudinal expansion to take place upon heating. The element 88 is provided with retaining legs 91 (either by attachment or by cutting out a suitable peripheral shape) for attaching the element 88 to the platform 86. By fixing these legs 91 to the platform 76 at a position spaced from their junction with the heat distribution element 88 separate means for accommodating later expansion of the plate are rendered unnecessary. Narrow slots 92 across the periphery from one edge to a position near to but not reaching the opposite edge are additionally provided to accommodate longitudinal expansion of the heat distribution plate 88 if this is considered necessary, but even this expansion can be accommodated by the resilience of the legs 91 with a suitable structure. The important feature is that the plate 88 should be freely movable over the underlying support to allow expansion and contraction with the increase and decrease in temperature during use and storage without being restrained in a manner likely to cause buckling or bowing.

The electrical resistance element is formed in two pairs, 86, 87 with the element 87 being approximately one third of the total area of the ironing board surface. A microswitch 101 (Figure 7) is provided to disconnect the resistance element 87 from the control box 78 and thus from the supply of electricity when the end portion 77 is folded for example for use with the pressure plate 93 as a trouser press. An electrical switch (not shown) in series with the resistance heater element 87 may alternatively or additionally be provided, which can be mechanically actuated by a cooperating member on the trouser press pressure plate 83 so that when this pressure plate is fitted to the board the electrical connection to the element 87 is broken even if it is not folded to the position illustrated in Figure 6.

The electrical resistance element 86, 87 comprise electrical resistance wires encased in mica, but may be made of other material such as lead/tin foil elements encapsulated in Mylar plastics film which has a temperature resistance of up to 130-150°C. In alternative embodiments electrical resistance wires may be embedded directly with suitable insulation) into the material of the heat distribution element 88.

Heat resistant insulated leads 89 extend from the surface of the board to the control box 78 which also serves as an iron rest.

As illustrated in the cross-sectional view (Figure 9) a cover 96 for the board has a flexible bolt rope 104 attached to the longitudinal periphery of the cover 96, which latter comprises two layers 102, 103 of fabric encasing a reticulated foam 94. The platform 84, 85 has an edge groove 95 into which the bolt rope 104 is introduced to slide the cover 96 onto the board and retain it firmly under

tension. The upper surface layer 102 of the cover 96 is made from thin high quality tightly woven cotton or like material whilst the under side has a looser more open weave. Longitudinal tension is maintained by attaching the bolt rope 104 to resilient fasteners or springs 97 fixed to one end of the platform 76.

One end of the cover 96 may be left open so that the foam element 94 may be withdrawn for replacement of the cover if this should become damaged or worn with long use whilst retaining the foam element 94. This latter may be a reticulated polyethylene or like foam which is silicon treated by a vulcanization technique to make it resilient to high temperatures.

In another embodiment (not illustrated) the foam material layer 94 is directly secured to the heat distribution plate 88 by means of suitable heat resistant adhesive, the whole then being covered with a single layer of fabric as a cover.

Finally, the distal legs 82 are provided with folding hooked feet 98 which can be used when the ironing board is folded as illustrated in Figure 7 to engage in suitable sockets 99 of a wall plate 100 which serves as a mounting bracket allowing the ironing board to be suspended from a wall in a tidy space saving manner.

Claims

1. Domestic laundry equipment comprising a heatable ironing board (11) having a substantially flat working platform (12; 76, 77), platform support means (14, 15, 17) for supporting the working platform (12; 76, 77) spaced from the ground, a heater (18; 86, 87) for raising the temperature of the platform surface, and a pressure plate (44; 83) for cooperation with the heatable platform (12; 76, 77) to form a static press assembly for pressing garments such as trousers, characterised in that means (42, 45, 47) are provided for detachably connecting the pressure plate (44; 83) to the heatable platform (12; 76).

2. Domestic laundry equipment according to Claim 1, characterised in that the pressure plate (44; 83) includes a separate heater element whereby to apply heat to both sides of a garment simultaneously.

3. Domestic laundry equipment according to Claim 1 or Claim 2, characterised in that the said connecting means (42, 45, 47) comprise mechanical connecting members (45) carried on the said pressure plate (44) for engagement with cooperating members (46) on the ironing board platform, resilient biasing means (47) acting between the said pressure plate and the connecting members whereby to urge the said pressure plate (44) into

contact under pressure with the platform (12) of the ironing board when the connecting members (45) are engaged with said cooperating members (46).

4. Domestic laundry equipment according to any of Claims 1 to 3, characterised in that the said platform support means comprise a plurality of legs (81, 82) and the said pressure plate (83) is provided with engagement means at or adjacent the edges thereof for cooperative engagement with mounting means carried by the said legs so that the plate (83) can be carried beneath the platform (76) to serve as an additional shelf when it is not being used as a garment press.

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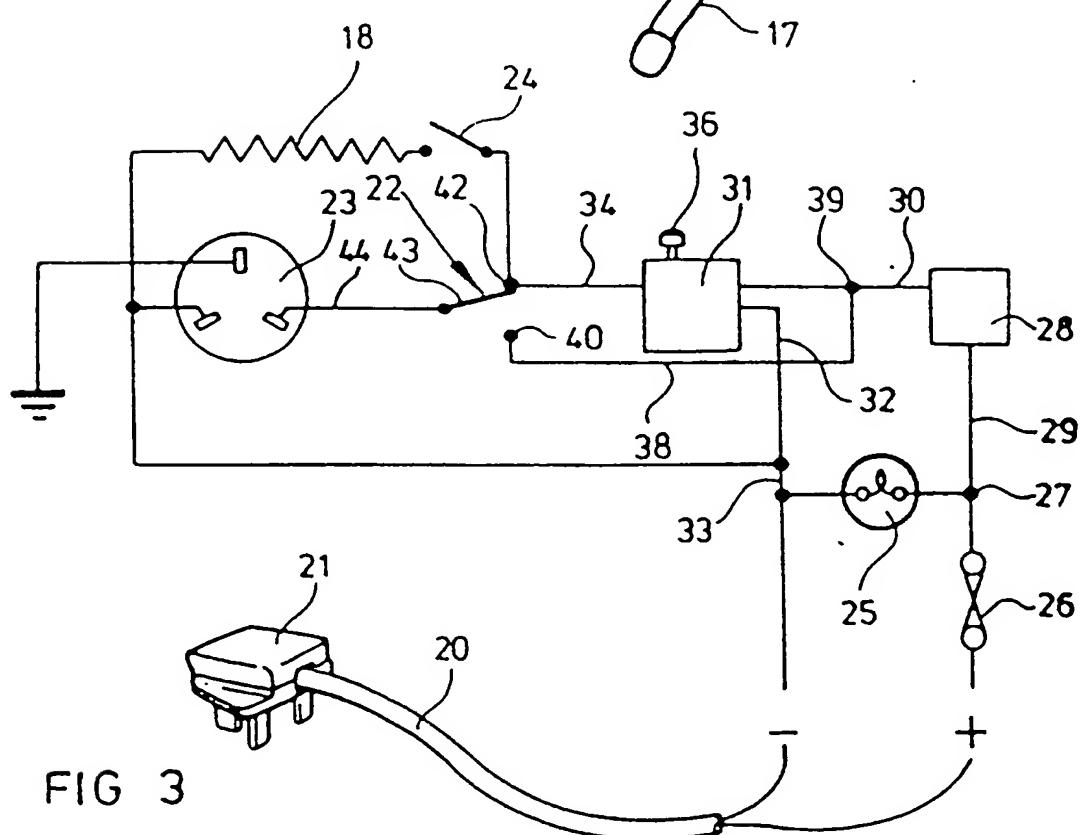
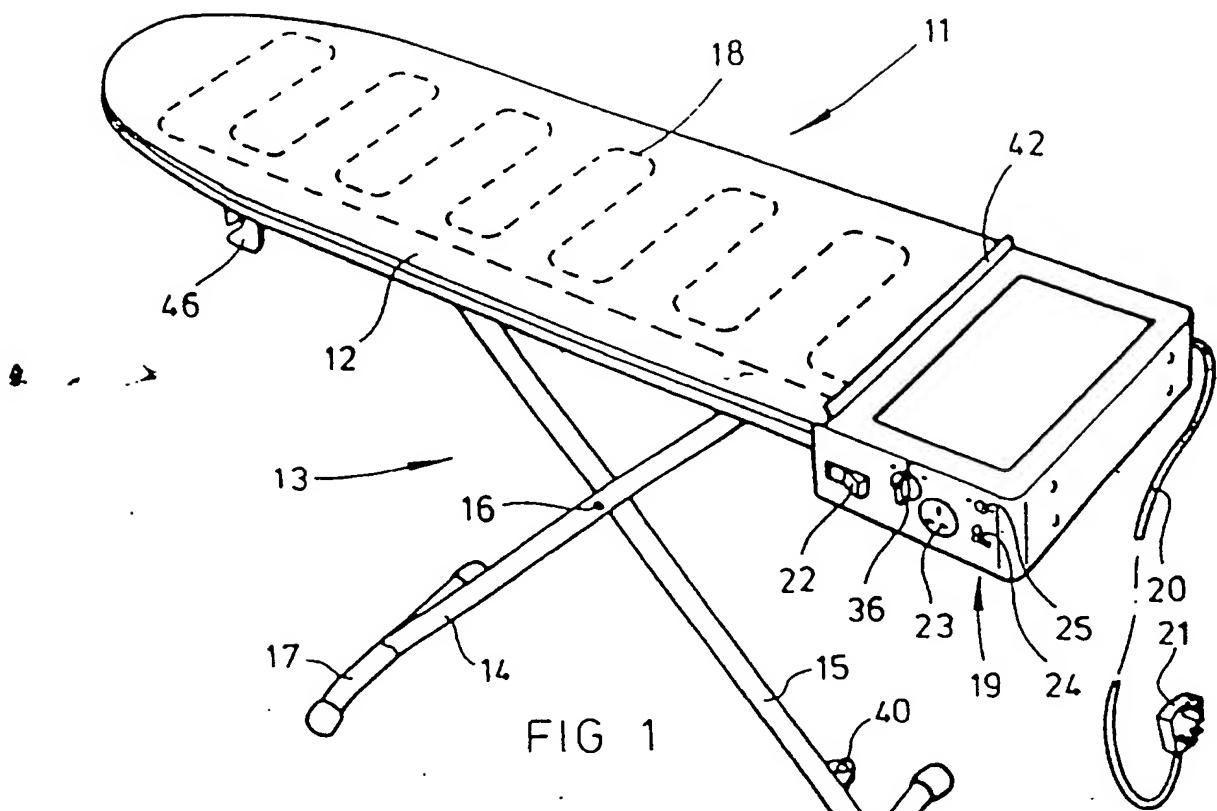


FIG 3

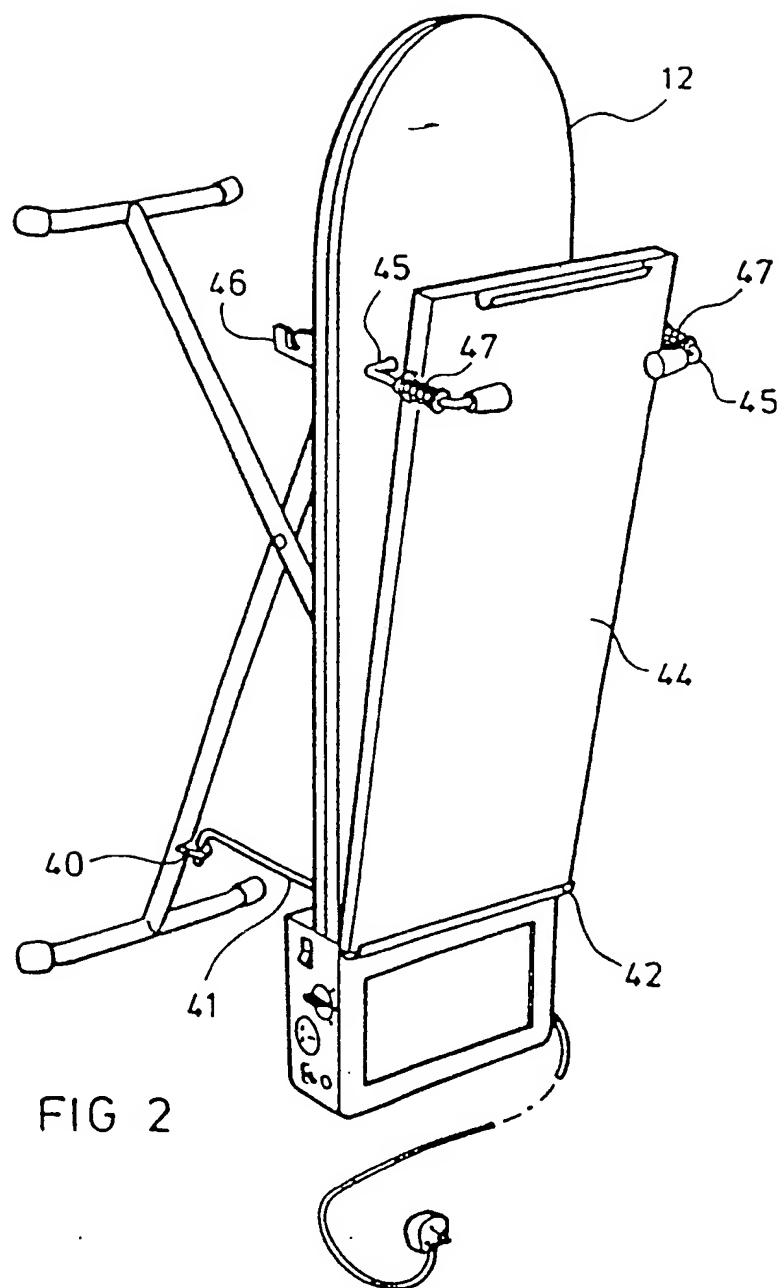


FIG 2

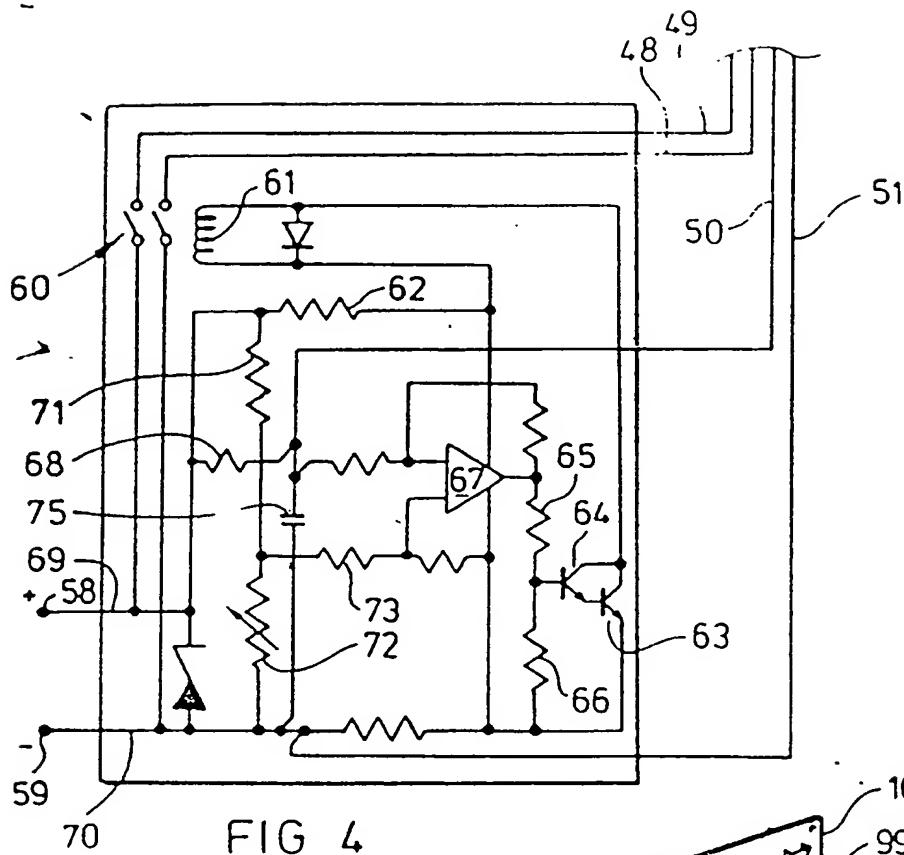


FIG 4

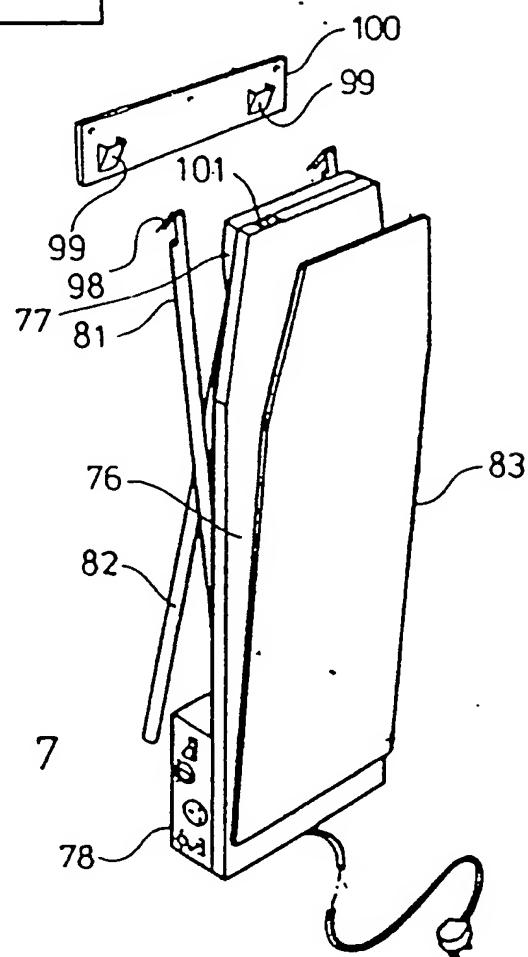
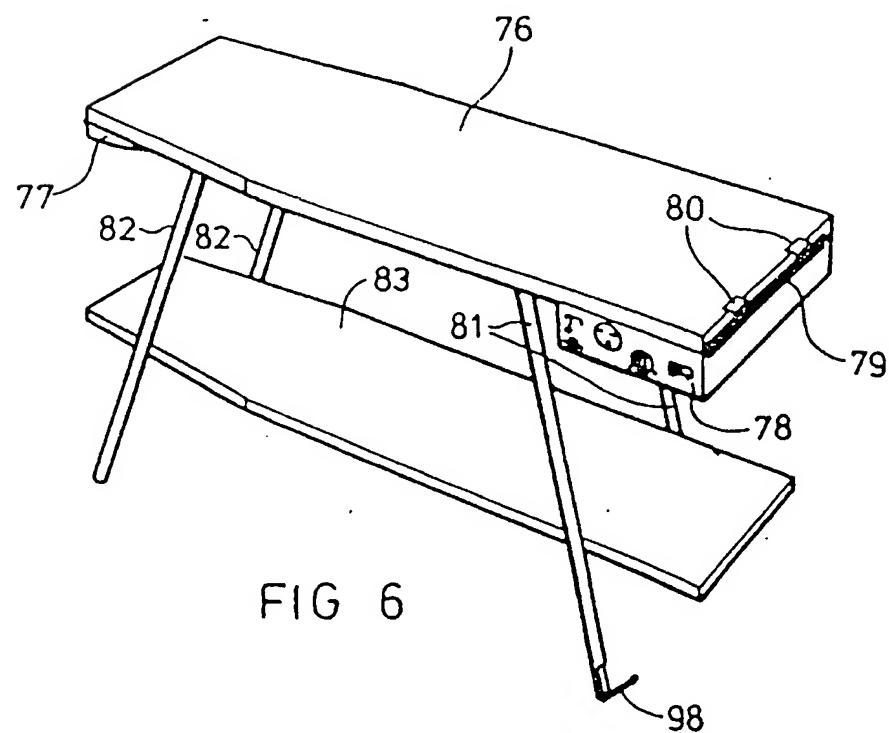
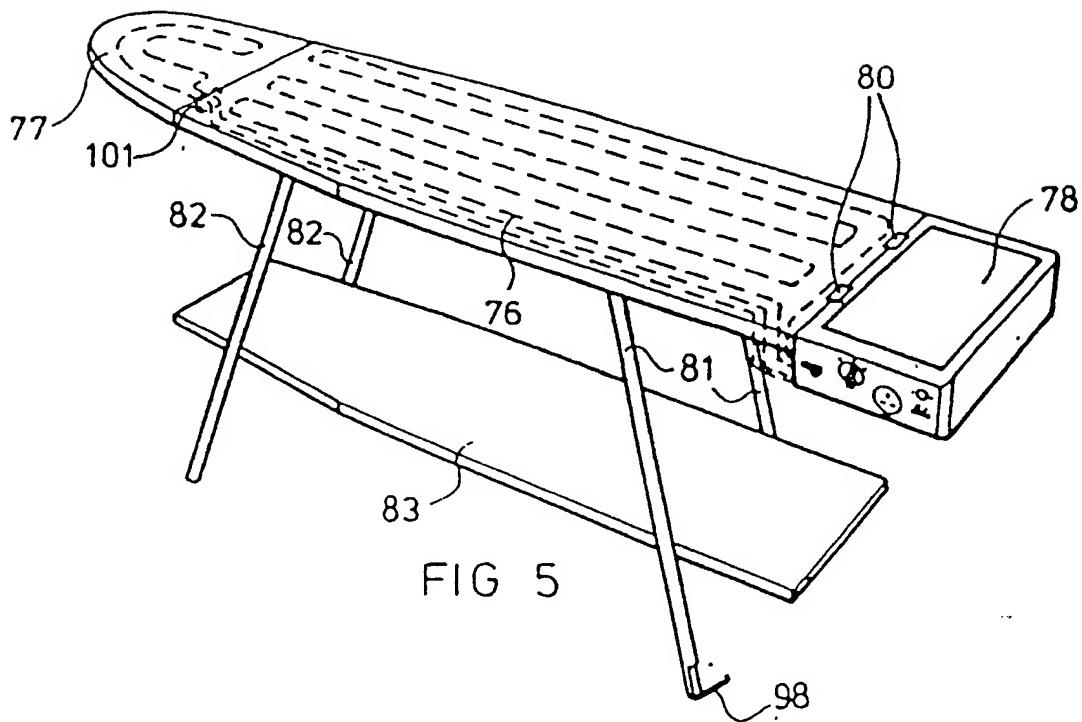
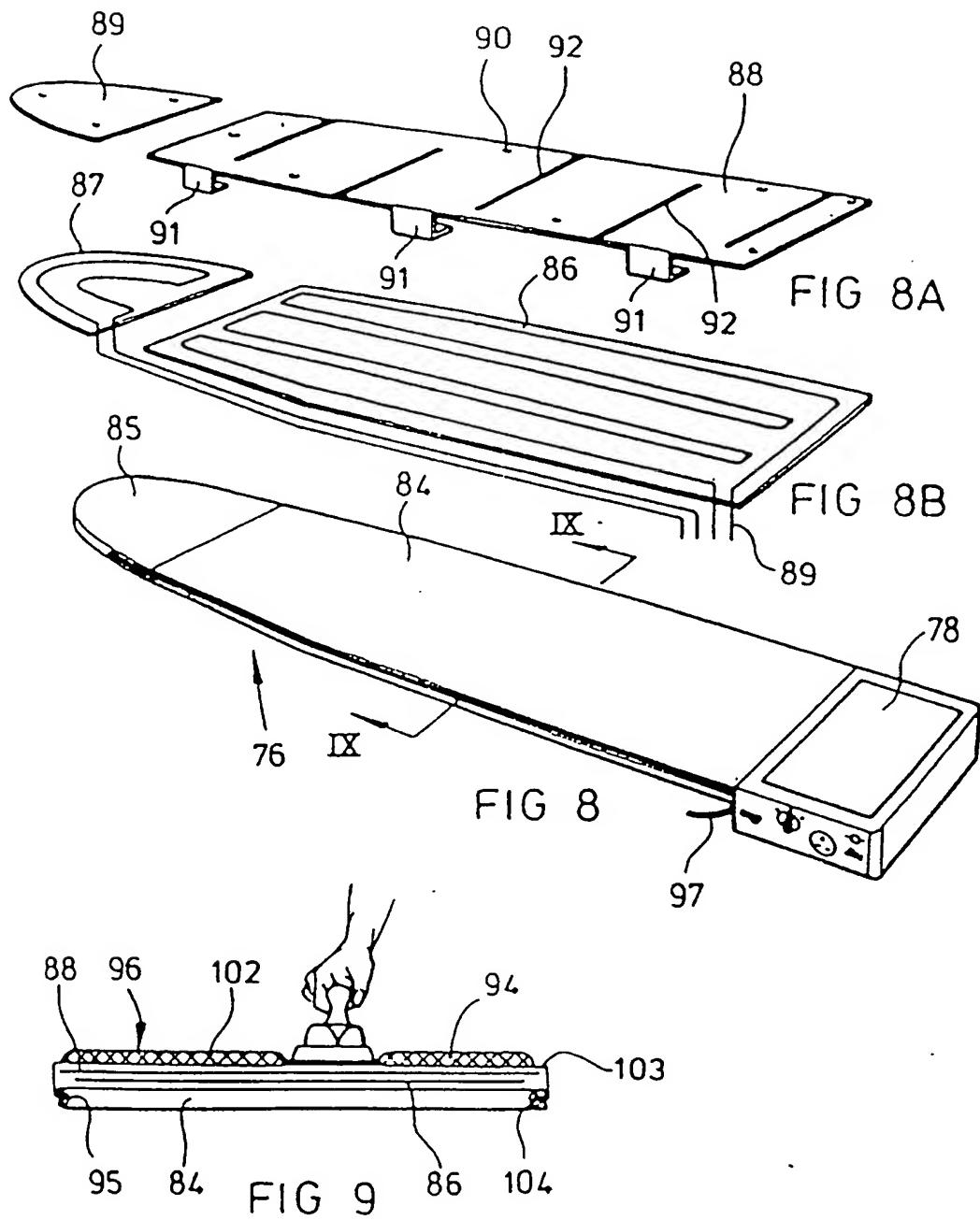


FIG 7





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